Unit 1: Introduction

1) Write two differences between production and productivity.

Production	Productivity
Production is concerned with activity of producing goods and services	Productivity is the efficient utilization of resources (inputs) in producing goods or services (outputs).
Production is the measure of the value of the output of goods and services.	Productivity is the measure of the efficiency of factors of production.
It is the actual process of conversion.	It is the utilization of resources to form goods.
For instance: a country can produce 10 cars.	For instance: 10 cars/day or 10 cars/labor etc.

2) What are the components of operations functions?

i. Core functions: marketing and sales, product/service development, operations
ii. Supporting functions: accounting and finance, human resource, IT, engineering

3) What is the continuous production system?

- Continuous production is a flow production method used to manufacture, produce, or process materials without interruption. In this system goods are produced constantly as per demand forecast. Goods are produced on a large scale for stocking and selling.

4) What is supply chain management?

- Supply Chain Management (SCM), the management of the flow of goods and services, involves the movement and storage of raw materials, of work-in-process inventory, and of finished goods from point of origin to point of consumption.

5) Write four differences between intermittent and continuous production system.

Intermittent production system	Continuous production system
In this production system, goods are produced based on customer's orders, the flow of production is not continuous.	In this production system, goods are produced constantly as per demand forecast.
These goods are produced on a small scale	Goods are produced on a large scale for stocking and selling.
Per unit cost of production is high	Per unit cost of production is low
Less security of jobs	More security of jobs

6) Define productivity with one example.

- Productivity refers to the measure of output (e.g. products) from a production process per unit of input (e.g. labor and capital). For example, a certain equipment can produce 10 tons of output per hour.

7) Point out four responsibilities of operations manager.

i. Understanding the operation's strategic objective
ii. Developing an operation strategy
iii. Designing products, services and processes
iv. Planning and controlling the operations

8) List five factors affecting location decision of manufacturing organization.

i. Nature of the input (raw material)
ii. Nature of output (product or service)
iii. Nature of technology employed
iv. Availability of labors & their skill
v. Transport facilities

9) List the objectives of operation management.

i. Production: design, deliver, develop, direct
ii. Performance: cost, quality, dependability, flexibility, speed
iii. People and group of people: society, customers, employees, shareholders, suppliers

10) List down the benefits of green productivity to the manufacturing industries.

i. Increase profitability
ii. Improves health and safety
iii. Makes quality products
iv. Promote environmental protection
v. Enhances company image

11) What is master production scheduling?

A master production schedule is a plan for individual goods to be produced in each time period such as production, staffing, inventory, etc. Its functions includes:

- Translating Plans
- Evaluating Alternative Schedules
- Facilitating Information Processing
- Produce Capacity Requirements
- Utilization of Capacity

12) What are the 5p of operation management?

i. Product
ii. process
iii. programs
iv. Plant
v. people

13) Define operation management and write about competitive operational priorities of a company.

➢ Operations management is an area of management concerned with designing and controlling the process of production and redesigning business operations in the production of goods or services. It is the administration of business practices for ensuring maximum efficiency within a business.

i. Cost
ii. Quality
iii. Delivery
iv. Flexibility

14) Write about automation and its use in operation management.

➢ Automation is the art of making processes or machines self-acting or self-moving.
➢ Production, services, inventory handling, product quality

15) List down important factors affecting productivity.

i. External factors: structural adjustment, Natural resources, government and infrastructure
ii. Internal factors: hard (product, plant, tech.) and soft factors (man power, work methods, management styles)

16) Define operations system with an example.

➢ Operating system converts inputs in order to provide outputs which are required by a customer. It converts physical resources into outputs, the function of which is to satisfy customer wants i.e., to provide some utility for the customer.

17) What are the resources for an operation?

i. Machines
ii. Tools
iii. Workers
iv. Physical areas

PEACE

UNIT 2: Operations Strategy

1) What is operation strategy?

- Operation strategy is defined as the development of a long term plan that develops high degree of compatibility between organization's resources and its long-term corporate strategy. It focuses on how the resources of organization should be configured to achieve the objectives of organizations.

2) List the components of operations strategy.

i. Designing of the production system
ii. Facilities for production and services
iii. Product or service design and development
iv. Allocation of resources.

3) What are the competitive dimensions of the organization?

i. Cost or price
ii. Quality
iii. Speed
iv. Dependability
v. Flexibility

Unit 3: Product and Service Design

1) Mention product development process.

i. Need identification.
ii. Feasibility study
iii. Advance design
iv. Product development and engineering
v. Product design and development
vi. Product evaluation and improvement
vii. Product use and support.

2) What are the components/elements of waiting line system?

i. Input source (or calling population)
ii. Queuing process
iii. Queue discipline
iv. Service process (or mechanism)
v. Departure pattern

3) Give the concept of concurrent engineering

- Concurrent engineering (simultaneous engineering) is a method of designing and developing products, in which the different stages run simultaneously, rather than consecutively. It decreases product development time and also the time to market, leading to improved productivity and reduced costs.

4) List down the five major queue disciplines.

i. First-come, first served (FCFS)
ii. Last-come, first served (LCFS)
iii. Service in random order (SIRO)
iv. Priority service
v. Pre-emptive and Non-pre-emptive priority

5) Write formulas of system utilization and system efficiency.

System utilization = $\frac{actual\ output}{design\ capacity}$

system efficiency = $\frac{actual\ output}{effective\ capacity}$

6) Introduce the term business process reengineering.

- Business process reengineering is the act of recreating a core business process with the goal of improving product output, quality, or reducing costs. In Business Process Reengineering, companies start with a blank sheet of paper and rethink existing processes to deliver more value to the customer.

7) What are the balking, reneging and jockeying in queue system?

i. Balking: customers deciding not to join the queue if it is too long
ii. Reneging: customers leave the queue if they have waited too long for service
iii. jockeying (customers switch between queues if they think they will get served faster by so doing)

PEACE

8) What are the types of customers relating to queuing system?

i. Patient customer
ii. Impatient customer : balking and reneging

9) What is computer-aided design?

- Computer-aided design is the use of computers to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing.

10) Write about utilization factor.

- Utilization factor is defined as the ratio of maximum demand on the power plant to the rated capacity of the power plant. It is the percentage of effective capacity that firm is actually using.

11) Write the benefits of CAD.

i. Product quality
ii. Shorter design time
iii. Production cost reduction
iv. Database availability
v. New range of capabilities.

Numerical problem:

1) In a restaurant customers arrive at the rate of 25 per hour. The employee can serve one customer every two minutes. What is the utilization rate of the employee?

Solution:

Given,

Mean customer arrival rate (λ) = 25 per hr.

Mean service rate (μ) = 2 mins i.e. 30 per hr.

Now,

Utilization rate (p) = λ/μ = 25per hr. /30per hr. = 0.83

Unit 4: Locations Decision and Facilities Layout

1) Why is location decision important in an organization?

i. The availability and cost of resources like labor, raw materials and other supporting resources may change.
ii. The geography of demand may shift. It may be desirable to change facility location to provide before service to the customer.
iii. Development of new technologies.

2) Differentiate between product layout and process layout.

Line or product layout	Functional or process layout
In product layout, similar machines are arranged according to the sequence of operations required for manufacturing the product.	In process layout, similar machines are arranged in one location for manufacturing the product
It leads to transfer lines	It leads to group technology
Work flow is smooth in this layout.	Work flow is not smooth.

3) Give two differences between product layout and the fixed position layout.

Product layout	Fixed position layout
Layout that uses standardized processing operations to achieve smooth, rapid, high volume flow.	Layout in which the product or project remains stationary, and workers, materials and equipment are moved as needed.
The layout is inflexible	There is maximum flexibility for all sorts of changes in product and process.
For e.g.: auto plants, cafeterias	For e.g.: building projects, disabled patient at hospitals.

4) Define fixed position layout in two sentences.

- Fixed position layout is defined as the stationary layout in which personnel, supplies, and equipment are brought to the site where the product will be assembled, rather than the product being moved through an assembly line or set of assembly stations. A fixed-position layout is appropriate for a product that is too large or too heavy to move.

5) Write the relationship between location and capacity planning.

i. Capacity planning: deciding on the maximum output rate of a facility
ii. Location analysis: deciding on the best location for a facility

Capacity planning and location analysis decision are often made simultaneously because the location of the facility is usually related to its capacity. In both capacity planning and location analysis, managers must follow three-step process to make good decision. The steps are assessing needs, developing alternatives, and evaluating alternatives.

6) Why is facilities layout important?

i. It increase production
ii. It reduce material handling
iii. Provide overall satisfaction and simplification
iv. Higher utilization of space, equipment and people

7) What is combination layout?

- A combination layout combines the advantages of both the process and product layouts. It is used when the same item is being manufactured in different types or sizes. It is extremely flexible and helps in increasing the quality of the product.

8) What are the different types of layout system?

i. Process layout (functional layout)
ii. Product layout (assembly line)
iii. Combination layout
iv. Fixed position layout
v. Cellular layout

Unit 5: Linear Programming

1) What is the application of duality in linear programming problem?

The implication of duality is that each linear programming problem can be analyzed in two different ways having equivalent solutions.

The Duality in Linear Programming states that every linear programming problem has another linear programming problem related to it and thus can be derived from it. The original linear programming problem is called “Primal,” while the derived linear problem is called “Dual.”

PEAC

2) Define the linear programing problem.

- The Linear Programming method is a technique of selecting the best alternative out of the available set of feasible alternatives, for which the objective function and the constraint function can be expressed as linear mathematical functions.
- A linear programming problem consists of a linear function to be maximized or minimized subject to certain constraints in the form of linear equations or inequalities.

3) What are the objectives of the linear programming?

i. To find maximum and minimum values of a function over a region
ii. Solve real-world problems

4) Give any three importance of linear programing for an operation manager.

i. It improves the quality of the Decisions
ii. Highlights the bottleneck in the production process
iii. Helps in attaining optimum use of productive factors

5) Mention the application of assignment problem.

- Assignment problem means job allocation based on the efficiency of the worker on one to one basis.

i. In assigning machines to factory orders
ii. In assigning sales/marketing people to sales territories.
iii. In assigning teachers to classes.

6) How does degeneracy occur in transportation problem?

- Degeneracy in transportation problem occurs when the number of stone squares (occupied cells) in a solution is less than the number of rows + the number of column – 1 (i.e. m+n-1). It also occur when two or more cells are vacated simultaneously in the problem of transferring occupied units along the loop.

7) Define unbalanced transportation problem.

- The transportation problem will be unbalanced if total supply ≠ total demand i.e. either supply exceeds demand or demand exceeds supply.

Unit 6: Aggregate planning and Inventory Management

1) What is aggregate production planning?

- Aggregate production planning denotes to the process of determine the overall quantities of products to be manufactured or produced in a plant or other manufacturing facility during a medium term planning period such as a month, or a quarter.

2) Write the steps of aggregate capacity planning process.

3) What is aggregate planning technique?

- Aggregate planning techniques involve both simple (trial and error) and advanced mathematical techniques. (Linear programming, linear decision rule, management coefficient model). This techniques helps to minimize cost and maximize profit.

4) Give the concept of demand options in aggregate planning.

- Demand options primarily focus on market aspects along with backorders that is strictly operational management in nature. Various demand options are:

i. Pricing
ii. Promotion
iii. New demand
iv. Complementary products/ services
v. Reservations

5) What is the percentage change in EOQ when demand is doubled?

- Solution:

  Let suppose: D=50, O=5 and C=2 then EOQ = $\frac{\sqrt{2DO}}{C}$ = 16 units

  If demand doubled then: D= 100 so, EOQ will be 22 units. Then percentage change in EOQ by approximately 41%

6) How do you differentiate between dependent demand and independent demand?

Dependent demand	Independent demand
Dependent demand is demand for component parts or subassemblies. Such as microchips in the computer, the wheels on the bicycle	Independent demand is demand for a finished product, such as a computer, a bicycle, or a pizza.

Unit 8: The Quality System

1) What are the phases of six sigma?

- Define (D)
- Measure (M)
- Analyze (A)
- Improve (I)
- Control (C)

2) List out the quality control tools.

i. Flowchart
ii. Control chart
iii. Histograms
iv. Scatter diagrams
v. Check sheet
vi. Cause and effect
vii. Pareto chart

3) Give the concept of quality function deployment.

- Quality Function Deployment (QFD) is a process and set of tools used to effectively define customer requirements and convert them into detailed engineering specifications and plans to produce the products that fulfill those requirements.

4) What are the benefits of JIT?

i. Reduced inventory levels
ii. High quality
iii. Flexibility
iv. Reduced lead times
v. Increased productivity

5) What is statistical process control?

- Statistical process control is a method of controlling the quality of the goods with respect to curtained standard maintained by the business organization in the process of production.

6) What do you understand by ISO9000?

- ISO 9000 is defined as a set of international standards on quality management and quality assurance developed to help companies effectively document the quality system elements needed to maintain an efficient quality system. They are not specific to any one industry and can be applied to organizations of any size.

7) Give the concept of six-sigma.

- Six sigma is a disciplined, data-driven approach and methodology for eliminating defects in any process from manufacturing to transactional and from product to service. Its aim is to achieve the highest possible sigma level. Highest possible sigma level refers to the lowest fault rate for all processes under examination.

8) What is importance of Gantt chart?

i. A useful tool for displaying time-based information within a project

ii. They provide a useful overview of project activities, a good starting point for project planning.

9) What is the application of control chart?

i. Monitor a process and signal when it goes out of control
ii. Determines process capability
iii. Provide visual aids.

10) Introduce the use of KANBAN (Japanese word = card) in JIT production system.

- Kanban is a concept that relates to obtaining materials or required items "just in time" for their introduction into the assembly or process.

11) What is control chart?

- Control chart is a statistical tool to study the variation in the process over time. A control chart always has a central line for the average, upper control limit and lower control limit which are determined from historical data.

12) List out any four dimensions of TQM.

i. Customer satisfaction
ii. Employee involvement
iii. Continuous improvement in quality
iv. JIt

13) Define statistical quality control.

- Statistical quality control refers to the use of statistical methods in the monitoring and maintaining of the quality of products and services. This helps to ensure that the process operates efficiently, producing more specification-conforming products with less waste.

14) List the seven wastes of inventory in just-in-time philosophy.

i. Waste of overproduction
ii. Waste of waiting
iii. Waste of transportation
iv. Waste of processing itself
v. Waste of stocks
vi. Waste of motion
vii. Waste of making defective products.

15) Write the concept of quality.

- The degree to which the design specifications for a product or service are appropriate to its function and use, and the degree to which a product or service conforms to its design specification.

16) What is JIT system?

- The just-in-time inventory system is a management strategy that aligns raw-material orders from suppliers directly with production schedules.
- A system of supplying goods as close as possible to when they are actually needed.

17) Enlist seven waste.

i. Waste of overproduction
ii. Waste of waiting
iii. Waste of transportation
iv. Waste of processing itself
v. Waste of stocks
vi. Waste of motion
vii. Waste of making defective products

18) What do you mean by ISO 14000 series?

- ISO 14000 is a series of environmental management standards developed and published by the International Organization for Standardization (ISO) for organizations. It provide a guideline or framework for organizations that need to systematize and improve their environmental management efforts.

19) What is quality management system?

- A Quality Management System, often called a QMS, is a set of internal rules that are defined by a collection of policies, processes, documented procedures and records. This system defines how a company will achieve the creation and delivery of the product or service they provide to their customers. This includes ISO 9001:2015, ISO 14000…….

Make-up 2019

1) **What do you mean by competitive advantage?**

- Competitive advantage is the leverage that a business has over its competitors. A competitive advantage is an advantage over competitors gained by offering consumers greater value, either by means of lower prices or by providing greater benefits and service that justifies higher prices.

2) **Differentiate between product and process layout.**

Product layout	Process layout
Able to produce a small number of products efficiently	Able to produce a large number of different products.
Resources used are specialized.	Resources used are general purpose.
Lower space requirements	Higher space requirements
Facilities are more capital intensive	Facilities are more labor intensive

3) **What is the use of assignment model?**

- Assignment problem is a special type of linear programming problem which deals with the allocation of the various resources to the various activities on one to one basis. It can be used to assign people in a particular job or assignment.

4) **What sorts of options with regard to capacity do we have to meet fluctuated demand?**

i. The workforce size ii. Work force utilization iii. Size of inventory

5) **What is continuous inventory system?**

- Continuous inventory system involves the maintenance of detailed inventory records in the accounting system. Continuous record is maintained on a transaction-by-transaction basis throughout the period.

6) **List out the philosophical elements of TQM**

i. Teamwork
ii. Quality circle
iii. Continuous improvement
iv. Leadership customer focus
v. Ethics, trust, recognition etc.

7) **Write the seven tools for quality (TQM).**

i. Check sheet
ii. Control chart
iii. Flow chart or run chart
iv. Pareto chart
v. Histogram
vi. Cause-and –effect diagram (fishbone or Ishikawa diagram)
vii. Scatter diagram

8) **What is green productivity?**

- Green Productivity (GP) is a strategy for enhancing productivity and environmental performance for overall socio-economic development. It offers small and medium businesses a way to achieve a competitive advantage by doing better with less.

SDC 2018

1) **Define transformation process of operations management.**

- A transformation process is any activity or group of activities that takes one or more inputs, transforms and adds value to them, and provides outputs for customers. It includes technology and skill which convert inputs to outputs. For example, a hospital transforms ill patients (the input) into healthy patients (the output).

2) **List the scope of operation management.**

i. Location of facilities
ii. Plant layouts and material handling
iii. Product design
iv. Process design
v. Quality control
vi. Materials management

PEACE

3) List the reasons for providing service through multi-channel system.

- Multi-channel waiting line system is suitable when the size of the entire population is expected to be large. Under this system, arrangement of service facility, a service center opens a numbered of service counter and different queue and made according to service counter.

4) Explain the concept of quality at source.

- Quality at the source is a lean manufacturing principle which defines that quality output is not only measured at the end of the production line but at every step of the productive process and being the responsibility of each individual who contributes to the production or on time delivery of a product or service.

5) Explain the term 'degeneracy' in transportation problem.

- Degeneracy means not generating all the required parametric values needed for competing the improve index Δ_{ij} for unoccupied cells. (Or) It occurs when the number of occupied squares or routes in a transportation table solution is less than the number of rows plus the number of columns minus 1.

6) Define the mixed (hybrid) strategy aggregate planning.

- Mixed strategy is the combination of level production and chase demand strategy which deals with multiples objectives, i.e., setting production equal to the forecasted demand. It is best way to achieve minimum costs.

7) Convert the given primal equation into dual.

Min (Z) = $2X_1 - 5X_2$
Subject to:
$X_1 + X_2 \geq 10$
$2X_1 + 3X_2 \leq 12$
And $X_1, X_2 \geq 0$

- Let Y_1 and Y_2 be two corresponding required variables. Then the dual of this primal LP problem is,

  Max $Z^* = 10Y_1 - 12Y_2$
  Subject to,
  $Y_1 - 2Y_2 \leq 2$
  $Y_1 - 3Y_2 \leq -5$
  $Y1, Y2 \geq 0$

SDC 2019

1) Explain random fluctuations in operations process.

- Random fluctuations are unplanned or uncontrollable environment influences such as late deliveries, recession, labor turnover, floods, strikes etc. that cause planned and actual output to differ in an operating system of the organization.

2) List out the key issues for operations managers.

i. Shift in economic activity
ii. Global perspective
iii. Innovation
iv. Quality problems
v. Risk management

3) Explain operation strategy as a competitive weapon.

- The main goal of the operations strategy via operations management is to make the strong competitive position in the market producing superior quality products and services in lower price. A firm competing in the market place depends on development of operations strategy. So, operations strategy is often used as the most potent competitive weapon.

PEACE

4) Define the concept of surplus variable with an example.

- A surplus variable refers to the amount by which the values of the solution exceeds the resources utilized. These variables are also called 'Negative Slack Variables'. It is added to greater than or equal to (≥) type constraints in order to get an equality constraint.
- For example: for a given inequality equation, $-X_1 + X_2 \geq 2$
  In order to form another equation from the above-mentioned inequality equation, a second variable is introduced which is S_2 and then it is subtracted from the left side. Thus, it can be written as: $-X_1 + X_2 - S_2 = 2$

5) Define the concept of waiting-line theory.

- Waiting line theory, also known as queuing theory, is the mathematical study of waiting lines. This theory can be used to model and predict wait times and number of customer arrivals. It comprised of four parts: Inputs, waiting line, workstations and priority rule.

6) What is cellular (group) layout?

- Cellular manufacturing is a type of layout where machines are grouped according to the process requirements for a set of similar items (part families) that require similar processing. These groups are called cells. Therefore, a cellular layout is an equipment layout configured to support cellular manufacturing.

7) Define the concept of acceptance sampling.

- Acceptance sampling is a statistical measure used in quality control that allows a company to measure the quality of a batch of products by selecting a specified number of products for testing.
  *[The process involves batch size, sample size and the number of defects acceptable in the batch. This process allows a company to measure the quality of a batch with a specified degree of statistical certainty without having to test every unit of product. The statistical reliability of a sample is generally measured by a t-statistic.]

8) Convert the given primal equation into the dual.

Min (Z) = $5X_1 - 4X_2$
Subject to:
$X_1 + X_2 \geq 20$
$2X_1 + 3X_2 \leq 15$
And $X_1, X_2 \geq 0$

- Let Y_1 and Y_2 be two corresponding required variables. Then the dual of this primal LP problem is,
  Max $Z^* = 20Y_1 - 15Y_2$
  Subject to,
  $Y_1 - 2Y_2 \leq 5$
  $Y_1 - 3Y_2 \leq -4$
  $Y1, Y2 \geq 0$

NCC 2019

1) List out the various processes for new product development.

i. Idea generation
ii. Idea screening
iii. Concept development and testing
iv. Marketing strategy development
v. Business analysis
vi. Product development
vii. Test marketing
viii. Commercialization

2) Describe ABC (Always Better Control) classification in inventory management.

- ABC analysis is an inventory categorization method which consists in dividing items into three categories, A, B and C: A being the most valuable items, C being the least valuable ones. This method aims to draw managers' attention on the critical few (A-items) and not on the trivial many (C-items).

3) What do you mean by aggregate planning?

- Aggregate planning is a marketing activity that does an aggregate plan for the production process, in advance of 6 to 18 months, to give an idea to management as to what quantity of materials and other resources are to be procured and when, so that the total cost of operations of the organization is kept to the minimum over that period.

4) What do you understand by the cost of quality?

- Cost of quality (COQ) is defined as a methodology that allows an organization to determine the extent to which its resources are used for activities that prevent poor quality, that appraise the quality of the organization's products or services, and that result from internal and external failures.

MMC 2019

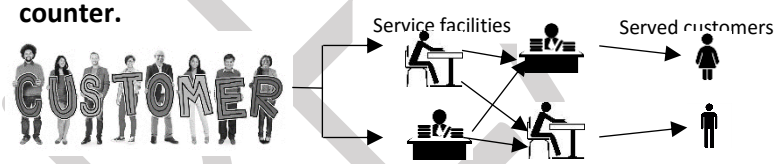
1) Define production.

- Production is a process of combining various material inputs and immaterial inputs in order to make something for consumption. It is the act of creating an output, a good or service which has value and contributes to the utility of individuals.

2) Mention the intangible factors for qualities analysis of alternative location.

i. Labor supply
ii. Business climate
iii. Attitude of community
iv. Union activities

3) Construct the figure of Multi-stage channel facility system. Arrangement of a service counter.



4) What is the % change in EOQ when the ordering cost is increased by 10%?

- Solution,
  Let suppose: D=50, O=2, C=1.5 then EOQ= 11.55 units
  If Ordering cost increased by 10%, we have O=2.2 then EOQ = 12.11
  Therefore EOQ is increased by approximately 4.8%

5) What do you understand by back order cost and shortage cost?

- A backorder is an order for a good or service that cannot be filled at the current time due to a lack of available supply. Backorder costs include cost incurred by a business when it is unable to fill an order and must complete it later.
- Shortage costs are those costs incurred by an organization when it has no inventory in stock. These costs include: Loss of business from customers who go elsewhere to make purchases.

JMC 2019

1) Mention the emerging issues in product and service design.

i. Value analysis
ii. Concurrent engineering
iii. Quality function deployment

2) What are the competitive weapons?

i. Cost or price
ii. Flexibility
iii. Quality
iv. Speed
v. Dependability

3) What are the importance of linear programming problem?

i. Many real problems can be approximated by linear models.
ii. The output generated by the linear programs provides useful "what is best" and "what-if" information.
iii. It leads the operational research.
iv. Helps in simplicity and productive management of an organization which gives better outcomes.

4) What are the cost associated with quality or types of quality cost?

i. Cost of preventive
ii. Cost of appraisal
iii. Cost of failures: (internal and external)

5) List out the tools and techniques of TQM.

Tools	Techniques
Arrow diagram, Matrix diagram, Control Plan,	Benchmarking, Design of Experiments,
Histogram, Sampling Pareto Diagram	Quality Function Deployment, Statistical Process Control, Quality Improvement Teams

6) A=816 units O= Rs.12, C=20%, less than 50 order size and 50 or more has Rs.20 and Rs.18 price respectively than which one has minimum total cost and EOQ.

We have,

	Order quantity	Price	Cost	EOQ
C1	Less than 50	Rs20	20% of 20= 4	70 units (not in order size)
C2	50 or more	Rs.18	20% of 18= 3.6	74 units

Therefore, A=816 units, O=Rs.12, C=Rs.3.6 have minimum total cost and EOQ

7) A single channel queuing system has Poisson arrivals and exponential service times. The mean arrival rate is six per hours and the mean servicing rate is 10 per hour. The expected proportion of time the facility will remain idle.

➢ Solution,

Mean arrival rate (λ) = 6 per hour

Mean servicing rate (μ) = 10 per hour

The probability that service facility is idle (p_0) = $1 - \frac{\lambda}{\mu} = \frac{2}{5}$

BMC 2019

1) What are the techniques of location decision?

➢ Qualitative techniques: Equal weights method, variable method, weights cum rating method
➢ Quantitative techniques: location Break even analysis, median method, center of gravity method

K&K 2019

1) What are the major roles of operation manager?

i. Direct role: planning, controlling, organizing, staffing, directing
ii. Indirect role: other function/department of the organization
iii. Broad role: responding to the emerging challenges such as technology awareness.

2) Explain service strategies.

- Service strategy is defined as the development of a long-term plan that define its service concept, operating system and service delivery system. The service strategy links the firm's strategic position with tactical execution.

3) Explain the competitive strategies.

- Competitive strategies refers to the long term planning to get the competitive advantage through the product differentiation, cost leadership and response. Operations managers turn these into tasks to be completed in order to deliver goods and services cheaper, better, or more responsively.

4) What are the types of inventory demands?

i. Dependent demand: when the demand for an inventory of an item is dependent upon the demand for another item. Like raw materials and component inventories.
ii. Independent demand: when the demand for an inventory of an item is not dependent upon the demand for another item. Like finished goods items.

PYC 2019

1) Write the dual of the following

Max Z = X_1+2X_2

Subject to:

$X_1+X_2 \leq 10$, $7X_1+3X_2 \leq 40$, $X_1+2X_2 \geq 12$, $X_1, X_2 \geq 0$

- Let Y_1, Y_2 and Y_3 be the corresponding required variables. Then the dual of this primal LP problem is,

  Min Z* $=10Y_1+40Y_2-12Y_3$

  Subject to: $Y_1+7Y_2-Y_3 \geq 1$, $Y_1+3Y_2-2Y_3 \geq 2$ and $Y_1, Y_2, Y_3 \geq 0$

2) What are the four major assumptions of EOQ model?

i. Demand is constant over time
ii. Instantaneous receipt of material
iii. No quantity discounts
iv. Lead time is known and constant
v. No stock-outs allowed

3) State any three major assumptions of waiting line theory.

i. Independent arrivals
ii. Exponential distribution
iii. The mean arrival rate is less than mean service rate
iv. Customer do not leave or change queues.

4) How is the control chart for variables different from attributes?

Control chart for variables	Control chart for attributes
Variables control charts plot continuous measurement process data, such as length or pressure, in a time-ordered sequence.	Attribute control charts plot count data, such as the number of defects or defective units.
For Example: $\bar{X}$-chart and R-chart	For example: P-chart, np-chart and C-chart

5) What is bill of material?

- A bill of materials (BoM) is an extensive list of raw materials, components, and assemblies required to construct, manufacture or repair a product or service. It is an engineering term that refers to the design of a product.

6) What are the main difference between reneging and jockeying customers?

Reneging customers	Jockeying customers
Reneging customers are those who arrive, view the situation, join the waiting line and after some period of time depart.	Jockeying customers are those who move from one queue to another hoping to receive service more quickly.
Automating the call-forward process prevent the reneging problem.	Employing a single line queue prevent the jockeying problem.

7) Sara James bakery has a plant for processing breakfast rolls. Last week the facility produced 1, 48,000 rolls. The effective capacity is 1, 75,000 rolls. The production line operates 7 days per week with three 8 hours shift per day. The line was designed to process a nut filled cinnamon flavored sugar coated deluxe rolls at the rate of 1200 per hours. Determine design capacity.

- Solution:
  Actual production last week = 148000 rolls
  Effective capacity = 175000 rolls
  Design capacity = 1200 rolls per hour
  Bakery operates 7days/week, three 8 hours shift
  So, design capacity = (7*3*8) * (1200) = 201600 rolls

8) Enlist two major objectives of SCM.

i. Get the good product in the right place at the right time and at the lowest cost.
ii. Reducing production cycle time.
iii. Improving quality
iv. Develop competent suppliers

9) Write the dual of the following:
Max Z = $12X_1$-$4X_2$
Subject to: X_1+$2X_2 \leq 2$, $2X_1$+$4X_2 \geq 8$, X1= 6 and X1, X2 ≥ 0

- Let Y_1, Y_2, Y_3, Y_4 be the corresponding required variables. Then the dual of this primal LP problem is,
  Min Z* = $2Y_1$-$8Y_2$+$6Y_3$-$6Y_4$
  Subject to,
  Y_1-$2Y_2$+Y_3+$Y_4 \geq 12$, $2Y_1$-$4Y_2 \geq -4$ and $Y_1, Y_2, Y_3, Y_4 \geq 0$

10) In an assembly operation at a furniture factory, six employees assembled an average of 450 standard dining chairs per 5-day week. What is the labor productivity of this operation?

- Solution,
  Total output = 450
  No. of employees = 6
  Labor productivity = $\frac{total\ output}{labor\ input}$ = 75 chairs per employee per 5-day week

11) Define order winner and order qualifier.

- An *order qualifier* is a characteristic of a product or service that is required in *order* for the product/service to even be considered by a customer.
- An *order winner* is a characteristic that will win the bid or customer's purchase. Therefore, firms must provide the qualifiers in *order* to get into or stay in a market.
- For example: dell computer: order winner= (Flexibility) and order qualifier= (affordable price, high level of quality etc.)

12) State different feasibility analysis to be carried out for new product development process.

i. Preliminary market analysis
ii. Creating alternative concepts of products
iii. Clarifying the operational requirements
iv. Establishing the design criterion and their priorities.

13) Differentiate between vision and mission of an organization.

- The differences are shown below:

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Vision	Mission
Vision is the ultimate goal. (future state)	Mission is the reason of existence of an organization. (present state)
It answers the question "where do we aim to be?"	It answers the question, "what do we do?" and "what makes us different?"
It may not achieve always.	It is achievable.

14) State different era of operations management with time period.

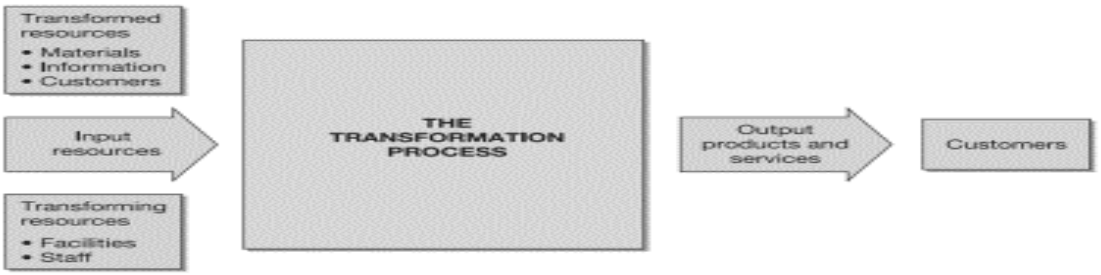
i. Cost focus early concepts: 1776-1880
ii. Mass production era: 1910-1980
iii. Quality focus lean production era: 1980-1995
iv. Mass customization era: 1995-2010

15) Define the situation of unbounded solution in solving linear programming using simplex method.

- A linear programming problem is said to have unbounded solution if its solution can be made infinitely large without violating any of its constraints in the problem.

PMC 2019

1) Define transformation process with diagram.



2) Show the linkage among the different operations strategies.

3) Give the meaning of hard and soft micro productivity factors.

- Hard factors are internal factors which are quite inflexible towards change. It includes product, plant, technology and material/energy.
- Soft factors are those internal factors which can be changed as required by management. It includes manpower, system and management styles.

4) Write down the meaning of traffic intensity or utilization factor in queuing system.

- Traffic intensity defines as probability that service facility is being used. Mathematically,

$$P = \frac{\lambda\ (average\ rate\ of\ arrival)}{\mu\ (average\ rate\ of\ service)}$$

5) Give the concept of fishbone analysis.

- A fishbone diagram, also called a cause and effect diagram or Ishikawa diagram, is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.
- Common uses of the Ishikawa diagram are product design and quality defect prevention to identify potential factors causing an overall effect.

6) How does center of gravity work in location decision?

- Centre of Gravity method finds location of distribution center that minimizes distribution costs. It considers geographical co-ordinates i.e. distance and loads.
- The center-of-gravity method is a quantitative technique that can be used to determine the optimal location of a facility based upon minimizing the transportation costs between where the good are produced and here they are sold or redistributed.

SAMB 2019

1) Define modular design.

- Modular design is a form of standardization in which component parts are subdivided into modules that are easily replaced or interchanged. It allows:
  - Easier diagnosis and remedy of failures.
  - Easier repair and replacement.

2) Differentiate between continuous and job shop production design in two major points.

Continuous production	Job shop production
In Continuous production, goods are produced constantly as per demand forecast. They are not produced on customer demands. For example: sugar refinery, soap	In Job shop production specific products are made for one customer at a time. For example: commercial printer.
There is no necessity of high skilled manpower.	Necessity of high skilled manpower.

3) What is Kaizen?

- ✓ ["Kaizen" refers to a Japanese word which means "improvement" or "change for the better".]
- Kaizen is an approach to creating continuous improvement based on the idea that small, ongoing positive changes can reap major improvements. It involves identifying benchmarks of excellent practices and instilling a sense of employee ownership of the process.

4) State the major one assumption of single queue model.

i. Arrivals are served on the first come first served (FCFS) basis.
ii. The mean arrival rate is less than mean service rate.

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